A2 The invention relates to a method and a base station for assigning channels for radio transmission, and in particular, for assigning channels for radio transmission between a subscriber station and a base station in mobile radio systems.

Page 1, between lines 10 and 11, please insert the following heading:

A3

BACKGROUND OF THE INVENTION

Please replace the consecutive paragraphs beginning at line 11 of page 1 with the following rewritten paragraphs:

In a GSM system (Global System for Mobile Communications), a combination of frequency division multiple access (FDMA) and time division multiple access (TDMA) is used. The available frequency band is divided into an uplink band (890 MHz - 915 MHz) and a downlink band (935 MHz - 960 MHz) with a band spacing of 45 MHz when using a frequency division duplex (FDD) method. Each of these bands is subdivided into 124 individual frequency channels at a spacing of 200 kHz. Each frequency channel is unambiguously numbered and a pair of equal numbers from the uplink band and the downlink band forms one duplex channel with a fixed duplex spacing of 45 MHz. This is the FDMA component. Within each frequency channel, a TDMA method with 8 timeslots per timeslot frame is used, the timeslot frames of the uplink band being sent with three timeslots delay compared with the timeslot frames of the downlink band for reducing the switching effort. A subscriber station in each case uses the timeslot having the same timeslot number (TN) in the uplink band and in the downlink band. This correspondingly also applies to the expanded GSM frequency bands and for DCS (Digital Communication System) 1800.

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In each timeslot of a timeslot frame, databursts of the same length are sent. A normal burst (NB) includes error-protection coded and encrypted user data, symmetrically separated by a so-called midamble (MA) for estimating the channel characteristics and corresponding channel equalization. The timeslot number, the midamble number and the channel type (control channel, traffic channel ...) apply both to the uplink band and to the downlink band in the GSM system.

Please replace the consecutive paragraphs beginning at line 21 of page 2 with the following rewritten paragraphs:

In a DECT (Digital Enhanced Cordless Telephone) system which also uses a combination of FDMA and TDMA at the radio interface, the total available frequency band (between 1880 MHz and 1990 MHz) is used in both directions. In contrast to the GSM system, where transmission and reception takes place in different timeslots for separating uplink from downlink. This is called a TDD (time division duplex) mode. According to the DECT standard, the first 12 timeslots of a DECT frame are provided for the downlink and the second 12 timeslots of the DECT frame are provided for the uplink. There is always a

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spacing of 12 timeslots between uplink and downlink of a voice connection. These 12 timeslots correspond to a period of 5 ms because the DECT system operates with a fixed switching point between downlink and uplink. If a DECT subscriber station requests a voice channel (full slot) on a particular timeslot, for example timeslot 18, and on a particular frequency fx, the uplink channel is unambiguously specified in accordance with the DECT standard. The uplink channel is on the same frequency fx and on timeslot 6 (18 - 12).

Future radio communications systems such as UMTS (Universal Mobile Telecommunication System) which, among other things, will offer a transmission capacity comparable to ISDN for services, such as video telephony and broadband connections, and will be used in the text which follows for representing the technical background of the invention without restricting the general applicability of the use of the invention, are based on the transmission channels being separated by spread-spectrum codes. The significant feature of a code division multiple access (CDMA) method is the transmission of a narrow-band radio signal in a wide frequency spectrum, the narrow-band signal being spread to a wideband signal by means of a suitable coding rule. In the UMTS system, two modes are provided, the FDD mode and the TDD mode. The FDD mode is a broadband CDMA characterized by the degrees of freedom of frequency and spread-spectrum code and the TDD mode is a TD/CDMA method characterized by the degrees of freedom of frequency, timeslot and spread-spectrum code. In the latter, the multiple access is achieved by means of a broadband TDMA/FDMA system in which a multiple access according to the CDMA method is allowed in certain timeslots of a timeslot frame. In the TDD mode, one or more variable switching points between uplink and downlink are provided within a timeslot frame, in order to achieve better management of the scarce frequency resources.

Please replace the consecutive paragraphs beginning at line 17 of page 4 with the following rewritten paragraphs:

In the case of asymmetric utilization of the paired band, the downlink band is heavily loaded and the uplink band is loaded only slightly. This can be expected, in particular, in the case of database enquiries such as from the Internet. In the case of asymmetric data services, it is assumed that a high data rate is required in the downlink and a low data rate in the uplink. Naturally, the situation can also occur the other way around, for example when sending a fax from a subscriber station.

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For this purpose, it has been proposed to allow a TDD mode in the uplink band of the paired band from the UMTS as a result of which a higher capacity utilization of the frequency resources is supposed to be achievable overall. This requires a new protocol for an unambiguous channel description which must be implemented both in the subscriber stations and in the base stations.

Page 4, between lines 36 and 37, please insert the following headings and paragraphs:

SUMMARY OF THE INVENTION

BRIEF DESCRIPTION OF THE DRAWINGS

In the text which follows, the invention will be explained in detail with reference to exemplary embodiments of the UMTS system and the associated drawing, in which:

Figure 1 shows a general representation of a radio interface in a radio communications system.

Figure 2 shows a representation of the frequency bands in the UMTS system.

A7 Cont.

Figure 3 shows an exemplary frequency band distribution in the paired band.

Figure 4 shows a timeslot frame with a variable switching point between uplink and downlink.

Figure 5 shows a timeslot frame with a number of switching points and CDMA multiple access.

Figure 6 shows parameters of a channel description without using a frequency hopping method in the TDD mode of UMTS.

Figure 7 shows a general representation of a channel description according to figure 6 by means of two information elements within a system information item.

Figure 8 shows a variant of the channel description with a common information element for both channel directions.

Figure 9 shows a further variant of the channel description with only one information element and with a flag being set.

Figure 10 shows a further variant of a channel description with one information element with fixed reference to uplink and downlink.

Figure 11 shows a general channel description for an uplink channel.

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Figure 12 shows a shortened channel description according to figure 11 for channels which differ in their spread-spectrum code.

Figure 13 shows a general channel description for a downlink channel.

Figure 14 shows parameters for a channel description in the FDD mode of UMTS.

Figure 15 shows a variant of a channel description by means of two information elements for each channel in the FDD mode of UMTS.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Please replace the paragraph beginning line 37 of page 4 with the following rewritten paragraph:

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The invention performs an efficient description of the channels with little signaling expenditure.

Please delete the paragraph beginning at line 1 of page 5 in its entirety.

Please replace the consecutive paragraphs beginning at line 7 of page 5 with the following rewritten paragraphs:

In one embodiment of the invention, there is a method for assigning channels for a radio transmission between a subscriber station and a base station of a radio communications system provides

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- a number of channel resources are unambiguously assigned to the subscriber station by means of a common channel description transmitted to it for the radio transmission
- and the channel description contains information on the order of utilization of the channel resources during the radio transmission.

According to another embodiment of the invention, the order of the utilization of the channel resources is specified by the order of the information of the individual channel resources within the channel description.

On the one hand, the fixed duplex spacing between the uplink band and the downlink band in the FDD mode is cancelled by dividing the paired band into FDD and TDD. On the other hand, any fixed allocation of the timeslots to downlink and uplink within a timeslot frame is cancelled with respect to a simultaneous support of symmetric and asymmetric services in the TDD mode. Hence, the position and spacing of the downlink channel and the uplink channel are unambiguously defined in a channel description for a channel assignment, independently of the transmission resource used.

A9 concl-

For this purpose, the uplink channel and downlink channel are described one after the other in a common information element and sent from the base station to a subscriber station in a system information in the dedicated control channel (DCCH) in an embodiment of the invention. According to a further embodiment, two information elements are set up for the uplink channel and the downlink channel and are transmitted separately. According to a further embodiment, a channel assignment is carried out by describing one channel when, for example, the uplink and the downlink channel differ in the timeslot number and all other parameters are identical. According to a further embodiment, both channels are described in a common information element and a flag indicates what applies to the uplink channel and what applies to the downlink channel. This corresponds to a new transmission parameter UL/DL within the system information message. A further channel description according to the invention is organized in such a manner that one information element describes the uplink channel whereas the downlink channel is described by a new transmission parameter. With regard to multicarrier multifrequency mobile radio systems, the frequency spacings between uplink channel and downlink channel are specified in an information element in a further embodiment. In a case where, for example, more than one physical channel is to be provided to the user for the purpose of real-time data transmission in one direction, the order in which the channels are to be used is unambiguously specified in the channel description in a further embodiment. In a scaling down of this proposal, the order of channel utilization can be given by specifying the relevant spread-spectrum code or also by specifying the frequency.

In the case of a channel change, either the downlink channel or the uplink channel can be changed which is why, according to the invention, a channel description is provided for the downlink channel or for the uplink channel in these cases, and not for both directions at the same time.

Please delete the paragraph beginning at line 6 of page 7 in its entirety.

Please replace the paragraph beginning line 23 of page 8 with the following rewritten paragraph:

In a UMTS mobile radio network used as an example of a radio communications system, a subscriber station MS and a higher-level base station MS, which is to be used as an example of a station of a radio cell, of a sector of a radio cell or of a network itself, communicate, according to figure 1, via a radio interface downlink DL and uplink UL, either in the TDD mode or in the FDD mode of UMTS. The base station BS can set up a connection to another subscriber station MS, for example a mobile station or any other mobile or stationary terminal via a further radio interface (not shown).

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Please replace the paragraph beginning line 13 of page 9 with the following rewritten paragraph:

However, partitioning of the channels in FDD and TDD eliminates the fixed duplex spacing of the FDD channels in the paired band between uplink and downlink, which is why the frequency spacing of a downlink channel and an uplink channel must be specified in the case of an assignment. Similarly, specification is necessary in the TDD mode with regard to the simultaneous support of symmetric and asymmetric services.

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Please replace the paragraph beginning line 30 of page 9 with the following rewritten paragraph:

An advantage of the TDD mode is the variable switching point between downlink and uplink within a timeslot frame. The variable switching points make it possible to use the available resources more efficiently for asymmetric services. For example, the switching point can be adjusted in such a manner that 12 timeslots of the timeslot frame are available for the downlink DL and the remaining 4 timeslots are available for the uplink UL (figure 4). Subtracting two timeslots for control channels, a total of 14 timeslots would thus still be available for traffic channels, 11 timeslots of which could be allocated to the downlink and 3 timeslots to the uplink. In this case, the TDD mode can support higher data rates in the downlink direction than in the uplink direction. The switching point SP can be adjusted by the network by "operations and maintenance" or also automatically varied in accordance with the current traffic volume.

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Please replace the consecutive paragraphs beginning line 18 of page 10 with the following rewritten paragraphs:

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A system with 3 switching points within a timeslot frame according to figure 5 will now be considered. If the uplink timeslot 15 is allocated to a subscriber station MS for a voice link, the downlink timeslot can be allocated to the subscriber station MS either from the range of timeslot 1 to 4 or from the range of timeslot 9 to 13. These timeslots ts are either less than 8 timeslots or more than 8 timeslots away from timeslot 15, 8 timeslots corresponding to a period of 5 ms, i.e. one half of the frame period of a 10-ms timeslot frame. This means that, with a variable switching point SP, the uplink channel and the downlink channel are unambiguously specified during the channel assignment.

In figure 6, the parameters for a channel description in the TDD mode of UMTS without frequency hopping are designated. A specific physical channel can be accurately defined with values for the type of the logical channel/subchannel, for the timeslot number TN, for the code group, for the spread-spectrum code, for the midamble MA and for the frequency f.

Please replace the consecutive paragraphs beginning at line 9 of page 12 with the following rewritten paragraphs:

A14 Cont.

In the first octet, bits 1 to 7 include the message type, namely: information elements IEI for the separate channel description in the uplink UL and in the downlink DL, respectively. Bit 8 is free. In the second octet, bits 1 to 4 specify the timeslot number TN in the uplink UL and the downlink DL, respectively, bits 5 to 8 specify the channel type which, as already mentioned, can be the same in the uplink UL and downlink DL. In the third octet, bits 1 to 4 specify the spread-spectrum code and bits 5 to 8 specify the midamble number MA, in the uplink UL and downlink DL in each case. In the fourth octet, bits 1 to 8 are set for identifying the code group in the uplink UL and downlink DL, respectively, and the bits in the fifth octet designate the frequency of the channels in the uplink UL and the downlink DL. Each channel is thus unambiguously characterized.

In a case where an uplink channel and a downlink channel differ, for example, by a timeslot number, a channel description can also be implemented by one information element IEI (DL_UL). The information element IEI (DL_UL) then specifies that downlink DL and uplink UL differ by 8 timeslots TN and the parameters of the downlink DL and uplink UL are otherwise identical. Such an information element IEI (DL_UL) is shown in figure 8.